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DECLARATION OF TRANSLATOR

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of any patent issued thereon.

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Device for Mounting Seat Covers

The invention relates to a device for mounting seat covers of any type on foam cushion components of a seat, a vehicle seat in particular.

In the category of vehicle seats, to which aircraft passenger seats also belong, in the more recent seat technology generation the previously customary wire insertion and tensioning systems have been replaced by a section fastening system (in this connection see, for example, DE 198 08 995 C1). In this new generation of section fastening systems, individual section strips, which may consist of cloth, leather, plastic materials, or the like, are mounted so as to be joined to the seat cover by way of sew-on narrowing strips. The respective section strips are oriented along the sew-on narrowing strips of the seat covers with respect to their extent and their length. The associated foam upholstery components of a particular seat, which are to be covered, consist of a conventional flexible foam material such as polyurethane foam and the seat component in question, together with its foam cushion, has on its side facing the seat cover channel-like recesses into which the respective section strip may be introduced, by hand for example, for a process of fastening the seat cover on the foam cushion component.

The section introduced in this manner has flank elements on the side edge and the respective flank elements extend under the end sides of the foam cushion component, which

delimit a channel-like central recess by which the section component may be introduced into the respective foam channel. One significant advantage of the section fastening systems in question is that in the case of worn out seat covers or foam cushion components such components may be replaced, by disengaging the section component mounted on the seat cover from the channel introduced into the foam cushion component. The respective section insert may be produced cost effectively as an extruded section, so that the fastening solution described may be applied cost effectively despite the manual assembly required.

On the basis of this state of the art, the object of the invention is to carry out the assembly steps as described at least in part automatically in order to obtain additional time and cost advantages. The object as thus formulated is attained by a device having the characteristics specified in claim 1 in its entirety.

Claim 1 specifies for the device claimed for the invention that gripping elements are clustered in actuation groups which serve to receive section strips mounted on the seat cover, the gripping elements pulling the section strips into channel-like recesses in the foam cushion component by means of a positioning mechanism, which permits relative movement between foam cushion component and the respective gripping element for the purpose of fastening the seat cover on the foam cushion component. The respective device permits essentially automatic operation of applying the respective section strip to the seat cover. The section strips, which are sewn on the lower side of the respective seat cover are accordingly introduced manually or automatically into the respective recesses in the gripping elements and fastened there. The gripping elements in question extend, in the fastening situation described, through recesses in the foam cushion component, which extend transversely relative to the respective channel-like guides for the section strip in question. As a result of relative movement of section strip and accordingly seat cover with respect to the channel-like recesses in the foam cushion component, the section strips are then fastened in the respective foam cushion component, the fastening

process involved being fully automatic. As soon as a particular section strip has been introduced into the associated foam channel in the foam cushion component, positioning of the seat cover on the foam cushion component to define the edges may then be carried out manually or, optionally, fastening on the foam cushion component may be performed by other operating equipment. The covered foam cushion component thereby obtained is then released as seat component from the device for subsequent use.

The device claimed for the invention may be specially adapted for special components of the seat involved, for example, for the headrest area, the backrest, the seat component itself, and, optionally, in the case of aircraft passenger seats, in the form of leg, foot, or calf rests.

Other advantageous embodiments of the device claimed for the invention are specified in the dependent claims. Reference will now be made to the accompanying drawings which show an exemplary embodiment of the present invention and in which in the form of diagrams not drawn to scale,

FIG. 1 shows a perspective view of the device as a whole in the initial state;

FIG. 2 a view of a process of introduction of the section strip of a seat cover into the associated openings for the gripping elements as illustrated in FIG. 1;

FIG. 3 a perspective view of a removal position for a finished covered seat component as illustrated in FIGS. 2 and 3;

FIG. 4 a removal position corresponding to that in FIG. 3 for the covered seat component, not shown;

FIG. 5 a perspective top view of a basic diagram illustrating a foam cushion component as seat component, together with the gripping elements of the device extending through the seat component;

FIG. 6 a bottom view of a seat cover with section strips extending longitudinally and transversely joined to the cover material by way of sew-on narrowing strips.

The device claimed for the invention is shown in FIG. 1 in its initial state. The respective device is used for mounting seat covers of any type; a bottom view of a seat cover is shown in FIG. 6 as an example. Such seat covers 10, which may consist of a cloth or leather material, or optionally of plastic, are to be fastened on foam cushion components 12 (see FIG. 5, for example) in order thus to obtain a seat component for a vehicle passenger seat or aircraft passenger seat. However, seat components such as these may also be employed as treatment chairs, for example, in an operating area or the like.

The exemplary embodiment illustrated relates directly to the seat component of a motor vehicle seat, but other seat components may be comparably covered, for example, ones such as headrests, backrests, leg rests, etc. The device claimed for the invention has a plurality of gripping elements 14, twelve gripping elements 14 being used in the present case for covering a seat component. The respective twelve gripping elements 14 are clustered in five actuation groups 16, 18, 20, 22, and 24, and accordingly integrated. The respective gripping elements 14 are designed to receive section strips 26, 28, 30, 32, and 34, which are positioned on the seat cover, it being possible to associate these section strips in the order indicated with the respective actuation groups of gripping elements 14. The section strips in question may be rigidly connected by way of sew-on narrowing strips 38 of conventional design to the lower side of the

seat cover 10 and form in their longitudinal and transverse directions the corresponding seams 39, 40, on the upper side of the seat component (see FIG. 3).

The device also has a positioning mechanism designated as a whole as 42, which, as is shown by comparison of FIGS. 1 and 4, makes relative movement between foam cushion component 12 and the respective gripping element 14 possible. The purpose of the automated device is to pull the individual section strips 26, 28, 30, 30, 34, into the associated channel-like recesses 44, 46, 48, 50, and 52, into the foam cushion component 12. In this way, the seat cover 10 may be reversibly fastened to the foam cushion component 12, that is, may be detached from the latter, as is to be discussed in greater detail in what follows.

As shown in particular by the diagram in FIG. 5, the gripping element 14 consists of a sort of gripping tong with each having two tong components 54 that may be moved relative to each other. The respective tong components 54 are formed by a longitudinal slot, which extends along the rod-like longitudinal axis of the gripping element 14 in its entirety. Gripping movement, that is a gripping process in which the gripping components are moved toward and detachably away from each other, is generated by a linear drive not shown, such as one in the form of a pneumatic servomotor or a linear unit for example, which makes the respective engagement movement possible. By preference the drive in question (not shown) grips the base component 56 (see FIG. 5) of each gripping element 14 and, obviously, a single drive is associated with an actuation group 16, 18, 20, 22, 24, so that the gripping or separation movement for the particular actuatable gripping element 14 is effected by means of only one drive for one actuation group collectively. Consequently, chronologically sequential actuation of the individual actuation group may be performed by the respective, preferably pneumatic, drive (not shown).

As is also shown in FIGS. 1 and 3, all gripping elements 14 are mounted on a common frame component 58, which is vertically positionable by means of a first linear drive 60. The respective linear drive has four operating cylinders 62 which, as is indicated in the figures, are mounted on the corners of the device and accordingly enclose the gripping elements 14 together with the frame component 58 on the external circumference side. The frame component 58, which encloses the gripping elements 14 on the external circumference side, may be moved to a position relative to the vertically stationary gripping elements 14 by way of the first linear drive 60. In this context it would also be possible to have embodiments in which the gripping elements 14 could be vertically adjusted in relation to the frame component 58 by a drive (not shown). In the present embodiment, however, the gripping elements 14 are mounted so as to be vertically stationary and permit the gripping movement already described only in a plane extending transversely to the vertical.

In addition to the frame component 58 in question, the positioning mechanism 42 has a support component 64 for supporting the foam cushion component 12 along its lower side. The respective support component 64 has openings through which the gripping elements 14 extend when the support component 64 is in a lowered position (see FIG. 1, for example). In addition, the gripping elements 14 are clear of these openings when such openings are in a raised position (see FIG. 4). Another linear drive 66 with four operating cylinders 68, preferably powered by pneumatic means, performs the function of placing the support component 64 in the form of a planiform or plate-like support element in individual positions; the respective four operating cylinders 68 are mounted, grouped in pairs, facing each other on a U-shaped frame piece 70, the free ends of which are connected to the upper side of the other four operating cylinders 62 and are raised together with the other four operating cylinders 68 during their extension movement. This results in movement superimposed by one linear drive 60 on that of the other linear drive 66.

For a better understanding, reference will now be made to an operating process, that is, an assembly process with the device claimed for the invention:

The device claimed for the invention is initially in its base position as illustrated in FIG.1. In this position all gripping elements 14 are closed, that is, the gripping components 54 of each gripping element 14 are essentially adjacent to each other and the head components 72 on the upper free end of the gripping elements 14 also are not separated. In the base or initial position in question, the foam cushion component 12 in the form of a conventional seat component, which forms a sort of bucket seat, is positioned on the gripping elements 14 and these elements extend through channel-like recesses in the foam cushion component 12, which is oriented vertically, transversely to the channel-like recesses 44, 46, 48, 50, and 52, in the foam cushion component 12. The lower side of the foam cushion component 12 is positioned on the upper side of the planiform support component 64. By means of the pneumatic control unit, the gripping elements 14 are then actuated, for example, by way of a foot-hand switch or the like and the tong components 54 of each gripping element 14 move apart, so that the head component 72 reaches a mounting position for each opened gripping element 14.

As is shown in FIG. 2, the first longitudinal section strip 26 may be introduced into the first actuation group 16 of gripping elements 14, either manually or by way of a handling system. The respective gripping elements 14 of the first actuation group 16 may then be closed. In a similar manner the other section strips 28, 30, 32, 34, are then introduced into the respective associated actuation groups 18, 20, 22, or 24, and the head components 72 move vertically to a corresponding axial distance from the associated channel-like recesses 44, 46, 48, 50, 52, in the foam cushion component 12. By preference the process of introduction of the section strips takes place in the sequence 34, 32, 30, 26, 28. After the respective procedure of introduction has been completed, and provided that all gripping elements 14 are closed and enclose the respective section strip, the frame component 58 is raised together with the support component 64 by way

of the first linear drive 60 with its four operating cylinders 62, as is shown in FIG. 3. The gripping elements 14, mounted to be stationary in the vertical direction, then pull the respective section strip 26, 28, 30, 32, 34, in the associated upward movement into the associated channel 44, 46, 48, 50, 52, in the foam cushion component 12 and the section strips involved are engaged in the associated channels.

In the respective installation situation, the edge components of the seat cover 10 are then pulled in over the associated cushion elements which surround the foam cushion component 12 on the edge and the covering process involved is completed as shown in FIG. 3. The gripping elements are then opened and, as is illustrated in FIG. 4, the other linear drive 66 is activated and the four other operating cylinders 68, acting on the U-shaped frame piece 70, move upward and in the process take at least the support component 64 upward with them. In the respective lifting movement the covered seat component is moved farther upward and the head components 72 of the gripping elements 14, which in the meantime have been moved to the release position, are disengaged from the associated channels in the foam cushion component 12, so that the latter, supplemented by the support component 64, may be removed by hand or by way of a handling unit. All gripping elements 14 are then closed again and the two linear drives 60, 66, are then brought in, so that the device moves to its initial position as shown in FIG. 1 for a new covering process. A repeated covering process may now begin.